

**3.2 Medical Requirements Overview****TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW**

<b>MEDB# and Title:</b>	MEDB 5.2 On-Orbit Strength & Conditioning Monitoring
<b>Sponsor:</b>	Medical Operations
<b>IPT:</b>	Bone, Muscle and Exercise
<b>Category:</b>	Medical Requirements
<b>References:</b>	SSP 50260 ISS Medical Operations Requirements Document (MORD) SSP 50667 Medical Evaluations Document (MED) Volume B
<b>Purpose/Objectives:</b>	To fulfill the medical requirement that all crewmembers shall participate in a program of prescribed and scheduled exercise during flight. The exercise prescription shall be recorded and adherence to the prescription will be evaluated. This information will be used to assess crew readiness for in-flight duties and EVA, assess countermeasure effectiveness, and provide a historical record of the exercise program performed during flight.
<b>Measurement Parameters:</b>	The following information will be collected:  For All Exercise Modalities: Number of training sessions/week.  For Treadmill with Vibration Isolation and Stabilization (TVIS): Speed of walking/running, subject load device (SLD) settings, heart rate, exercise duration For Cycle Ergometer with Vibration Isolation System (CEVIS): Work rate (Watts), pedaling speed, heart rate, exercise duration, arm or leg session For Resistive Exercise Device (RED): Exercises performed, number of sets and repetitions, load settings
<b>Deliverables:</b>	<ol style="list-style-type: none"> <li>1. Exercise prescriptions for each crewmember, updated as the mission progresses.</li> <li>2. Interim reports to the surgeon regarding the exercise activities conducted during flight for each crewmember.</li> <li>3. A final summary report detailing all exercise conducted during flight.</li> </ol>
<b>Flight Duration:</b>	≥30 days
<b>Number of Flights:</b>	Every Expedition
<b>Number and Type of Crew Members Required:</b>	All prime, and back-up crewmembers for preflight training.
<b>Other Flight Characteristics:</b>	N/A

**3.3 Preflight Training:****TABLE 3.3: PREFLIGHT TRAINING**

Preflight Training Activity	Description:	Countermeasures Systems Operations 1 (for all crewmembers): This lesson introduces crewmembers to initial CMS hardware components, stowage locations, operating procedures, and interfaces. The first part of the lesson concentrates on the purpose and operation of the components. This is followed by hands-on procedures using the hardware, including checkout and stowage procedures.			
	Schedule:	<u>Countermeasures Systems Operations 2 (for all crewmembers)</u> : This lesson introduces crewmembers to remaining CMS hardware components, stowage locations, operating procedures, and interfaces. The first part of the lesson concentrates on the purpose and operation of the components. This is followed by hands-on procedures using the hardware, including checkout and stowage procedures.			
		Duration:	Schedule:	Flexibility:	Personnel Required:
		CMS Ops 1: 2 hrs CMS Ops 2: 2 hrs	L-1 year L-1 year	+/- 5 days +/- 5 days	Trainers/Crew Trainers/Crew
Ground Support Requirements Hardware/Software	Preflight Hardware:		Preflight Software:	Test Location:	
	Flight Training CEVIS Flight Training TVIS Flight Training RED Medical Equipment Computer (MEC)		CEVIS Logging Software TVIS Logging Software RED Logging Software	U.S	
Training Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	Approximately 15 ft. x 15ft.	One 110 VAC (USA)	20 -25°C	N/A	
	Hot or Cold Running Water:	Privacy Requirements:	Other:		
	N/A	N/A	N/A		
Constraints/Special Requirements:	N/A				
Launch Delay Requirements:	N/A				
Notes:	N/A				

**3.4 Preflight Activities:****TABLE 3.4: PREFLIGHT ACTIVITIES**

Preflight Activity	Description:	<u>Exercise Prescription</u> The ASCR/EXL team will develop an aerobic and strength exercise prescriptions for each crewmember. This prescription will utilize the individual crewmember’s medical history and current physical condition. Once developed, the individual prescriptions will be reviewed by the crew surgeon and updated as needed. Exercise sessions using high fidelity training equipment identical to that presently on ISS will be made available at least twice per week for training and familiarization -at L-6 months and follow their initial exercise prescriptions for flight. During these sessions the Astronaut Strength, Conditioning and Rehabilitation (ASCR) team will familiarize the crew with use of the exercise equipment, associated software and their individual exercise prescriptions. The prescriptions for aerobic and strength exercises will be reviewed by the Crew Surgeon and Exercise Lead. Prescriptions will be updated according to the individual crewmembers condition.			
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:
		2 hrs	L-6 months: 2x per week and thereafter	N/A	Crewmember/ASCR
Ground Support Requirements Hardware/Software	Preflight Hardware:		Preflight Software:	Test Location:	
	Flight Training CEVIS Flight Training TVIS Flight Training RED Medical Equipment Computer (MEC)		CEVIS Logging Software TVIS Logging Software RED Logging Software	U.S.	
Testing Facilities	Minimum Room Dimensions:		Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:
	Approximately 15 ft. x 15ft		Three 110 VAC (USA)	20 -25°C	N/A
	Hot or Cold Running Water:		Privacy Requirements:	Vibration/Acoustic Isolation:	Other:
	N/A		N/A	N/A	N/A
Constraints/Special Requirements:	N/A				
Launch Delay Requirements:	N/A				
Notes:	Takes place during normally scheduled gym time				
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):				
	Progress reports will be given to the crew surgeon on a periodic basis preflight.				

**3.5 In-Flight Activities****TABLE 3.5.1: IN-FLIGHT ACTIVITIES**

<b>In-Flight Activity</b>	<b>Description:</b>	<b>Daily Aerobic and Strength Exercise</b> Two sessions of daily physical exercise lasting 2.5 hours based on the preflight prescriptions will be scheduled for each U.S. crewmember in-flight. The session will include time for set-up and takedown of hardware and post-exercise session hygiene. Aerobic exercise will consist of active or passive TVIS and/or CEVIS, while strength conditioning will consist of work on a resistance exercise device (RED). In-flight results will be transferred into the individual exercise data management program on the MEC. Exercise requirements for CEVIS and TVIS are stored on PCMCIA cards and changes to individual exercise prescriptions can be uploaded to the cards on orbit. Executed RED activities will be recorded manually, entered into the MEC weekly and downloaded via the MEC.					
	<b>Schedule:</b>	<b>Activity:</b>	<b>Duration:</b>	<b>Schedule:</b>	<b>Flexibility:</b>	<b>Blood Volume:</b>	<b>Personnel Required:</b>
		Aerobic and Strength Exercise	2.5 hrs	Recurrent as prescribed	N/A	N/A	Crewmember
		MEC Exercise Data Download	40 min	Weekly	N/A	N/A	Crewmember
<b>Procedures:</b>		As prescribed					
<b>Constraints / Special Requirements:</b>		1. To begin no earlier than 75 minutes after meal. 2. To begin no earlier than 60 minutes post-sleep. 3. Complete no later than 2 hours before the start of sleep. 4. Deviations from the above are possible on a case-by-case basis. 5. Minimum rqmts: Schedule upcoming CMs beginning FD5 with 01:00/day exercise of choice. Post STS departure, resume nominal ISS exercise plan. Schedule returning CMs starting day of hatch opening with 2-1:00/day exercise blocks (TVIS emphasized) through day of undock. Post departure, follow STS exercise plan.					
<b>Photo / TV Requirements:</b>		Treadmill: Obtain video of an exercise session of one crewmember using TVIS. This is requested twice per Increment. RED: obtain video of an exercise session of all crewmembers using the RED. This is requested twice per Increment. CEVIS: Obtain video of an exercise session of one crewmember one time per Increment. Video of the PFE (MR080L) may substitute for the CEVIS exercise session. 10 min setup, 10 min stow per session.					
<b>Cold Stowage Requirements:</b>		N/A					
<b>Mission Extension Requirements:</b>		As Prescribed by Flight Surgeon					
<b>Landing Wave-Off Requirements:</b>		N/A					

Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):
	<p>Individual exercise logs will be downloaded to MCC once a week and placed into a share folder designated to the ASCR/EXL team. A copy of the logs will be archived on an FTP server in building 8. The ASCR/EXL team will review data sets for determination of exercise frequency, duration, intensity, development of expedition exercise activity profiles, and assessment of exercise adherence. Prescriptions will be modified as necessary based on the crewmembers performance. Biweekly interim reports regarding the exercise activities and prescribed exercise activities conducted during flight shall be compiled and completed by ASCR/EXL personnel. These reports will be delivered to the Flight Surgeon from the Exercise Lead and the ASCR within 14 working days of receipt of data. A final summary report of all exercise conducted during the ISS Increment shall be delivered within 30 days of mission end.</p>

**In-Flight Activities, (cont.)****TABLE 3.5.2: IN-FLIGHT HARDWARE**

Hardware/Software Name	P/N
Russian Ergometer (Veloergometer)	Xm2.893.048
ISS Ergometer	SEG46115811-XXX
CEVIS Accessory Bag	SEG46116009-XXX
Isolator Kit Assembly	SEG46116012-XXX
On-Orbit Mounting Frame	SEG46116010-XXX
IVIS Box, Blue	SED46110777-XXX
IVIS Box, Red	SED46110777-XXX
IREN Logging Software	TBD
iRED Assembly, Fore	SED46115813-XXX
iRED Assembly, Aft	SED46115813-XXX

## MEDB 5.2 On-Orbit Strength & Conditioning Monitoring

MEDB 5.2  
SLSDCR-SMCCB-07-010-R2

Hardware/Software Name	P/N
iRED Mounting Plate, Fore	SEG46116033-XXX
iRED Mounting Plate, Aft	SEG46116033-XXX
iRED Stabilizer Interface Plate (4)	KLT410188-XXX
iRED Squat Support, Top (2)	SEG46116034-XXX
iRED Squat Support, Bottom (2)	SEG46116034-XXX
iRED Accessory Kit	SEG46116032-XXX
iRED Adapter Plate	SEG46116968-XXX
Medical Equipment Computer Kit 1	SEG46116031-XXX
PCMCIA Card	SEG46116005-XXX

### 3.6 Postflight Activities: No Postflight Activities

### 3.7 Summary Schedule

**TABLE 3.7: SUMMARY SCHEDULE**

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	BLOOD VOLUME	PERSONNEL REQUIRED	CONSTRAINTS
<b>Preflight Training</b>						
CMS Ops 1	2 hrs	L- 1 year	+/- 5 Days	N/A	Trainers/Crew	None
CMS Ops 2	2 hrs	L-1 year	+/- 5 Days	N/A	Trainers/Crew	None
<b>Preflight Activities</b>						
Exercise Prescription on Flight Devices	2 hrs	Part of Normal Exercise Time	N/A	N/A	ASCR/Crewmember	None
<b>In-Flight</b>						
Daily Aerobic and Strength Exercise	2.5 hrs	Recurrent as prescribed	N/A	N/A	Crewmember	<ol style="list-style-type: none"> <li>1. To begin no earlier than 75 minutes after meal.</li> <li>2. To begin no earlier than 60 minutes post-sleep.</li> <li>3. Complete no later than 2 hours before the start of sleep.</li> <li>4. Deviations from the above are possible on a case-by-case basis.</li> <li>5. Minimum rqmts: Schedule upcoming CMs beginning FD5 with 01:00/day exercise of choice. Post STS departure, resume nominal ISS exercise plan. Schedule returning CMs starting day of hatch opening with 2-1:00/day exercise blocks (TVIS emphasized) through day of undock. Post departure, follow STS exercise plan.</li> </ol>
<b>Postflight-NA</b>						
<b>Postflight Debrief</b>						
Debrief	No extra time	~R+30 days	As scheduled	N/A	ASCR/EXL Rep/Crewmember	Included as part of the Med Ops overall debrief.